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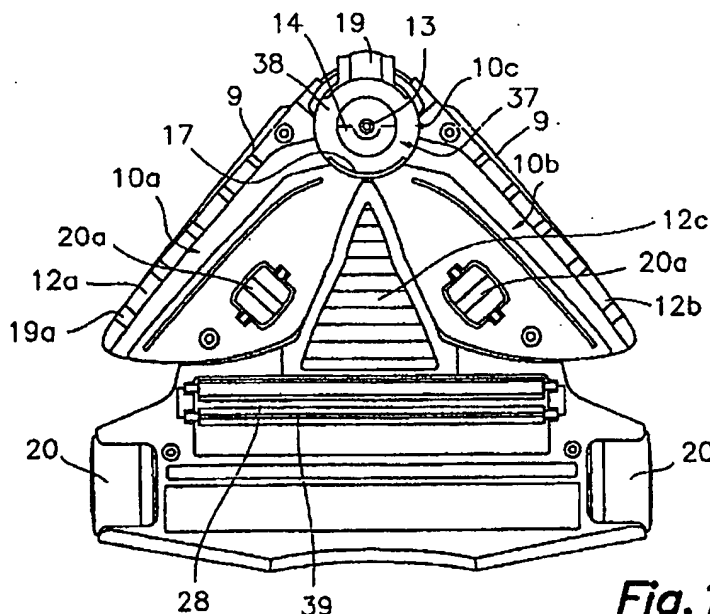
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**(54) HEAD FOR A DUST VACUUM CLEANER**

(57) It comprises a central hollow body (12c) including a central part (10c) of the open chamber connected to a negative pressure source and at least two side hollow bodies (12a, 12b) joined to both sides of central hollow body (12c) by a hinge (13) which admits rotations with respect to a common axis substantially normal to the surface to be treated. The central part (10c) of the open chamber (10c) has an opening (14) at the hinging

area (13) and side hollow bodies (12a, 12b) comprise respective side parts (10a, 10b) of the open chamber communicated with the said opening (14) of central part (10c) of the open chamber through the said hinge (13). Thus, the sucking front has a variable geometry and comprises, by means of the said three side and central part (10a, 10b, 10c) of the open chamber the two side and central hinge (13) of the head.



**Fig. 1B**

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## Description

### Field of the invention

[0001] This invention refers to a head for dust vacuum cleaner and more specifically to a head for a dust vacuum cleaner provided with a sucking front which may adopt a variable geometry, adapted for treating relatively large and clear surfaces in order to reach every angle and/or corner.

### Prior art

[0002] Since long ago, heads are known in the market for dust vacuum cleaners, specially for home or half industrial use, constituted by a first central structural element which integrates a hollow body connected to a negative pressure source through a suitable duct which generally includes a length of stiff pipe connected hinged on the said central structural element serving in addition for handling the head without it is required to bend down. A second elongated structural element is linked by its medium point crosswise the first element and comprises an open chamber pneumatically connected to the said hollow body, the said open chamber is partly closed when the head is applied on the surface to be treated, delimiting at least a straight sucking front, crosswise to the head central body. The width of such sucking front, according to the power of the negative pressure source machine, defines the vacuum cleaner rating, because wider the front will be less consecutive parallel passes will be required for covering a same surface.

[0003] However, although a head with a wide sucking front is useful in relatively large and clear surfaces it has significant drawbacks when the surface to be treated includes angles and/or corners, such as for example the angles formed by two walls in a corner of a room, or corners concealed under the pieces of furniture.

[0004] It has been tried to remedy the said drawbacks providing an exchangeable set of heads for a vacuum cleaner, so that in addition to the said head having a wide sucking front, other heads are available with sucking fronts which are narrower or having different shapes adapted to different corners or angles. However, this has the drawback of being continuously changing the heads, apart from the disturbance it means to have to keep a multitude of small separate elements together with the vacuum cleaner.

[0005] On the market an approach to remedy the said problem is also known in the market consisting in providing a vacuum cleaner with a single head having a relatively long point-shaped sucking front forming an approximately straight angle so that the said head is adapted to reach corners and angles as above disclosed. However, this head has the drawback that, although it has the said relatively long sucking front, it always shows an actual sucking front much narrower because

it is bent in straight angle. Thus, to cover a given surface to be treated, a larger number of passes are required with a point-shaped bent sucking front than with a front having same length but straight shaped, crosswise the direction of the passes.

[0006] Another approach to overcome the problem is to provide a sucking head having a variable shape of the sucking front.

[0007] US-A-3085267 discloses a vacuum cleaner head provided with a single open sucking chamber, crosswise the direction of the passes, having a surrounding flexible lip mounted in an elongated hollow body formed by different hinged lengths which confers the mouth of the open chamber a slight capacity to adapt itself to concave or convex surfaces. The connection with the negative pressure source is carried out through the central length.

[0008] US-A-5502870 discloses a vacuum cleaner nozzle in which a central body connected to the negative pressure front extends in two sucking arms mounted so that they can rotate up to 90 degrees in a plane substantially perpendicular to the surface to be treated, so that its sucking channels can be facing each other forming a pipe. In an intermediate position, the head is useful for sucking convex dihedral surfaces, such as stairs. However, neither this model nor the former are adapted for sucking corners such as angles between walls on flat surfaces.

[0009] US-A-3739421, EP-A-276396 and EP-A-0894468 show respective heads provided with variable sucking fronts which have in common that they are supported on three hinged parts on a plane substantially parallel to the surface to be treated. In the three models, a central hollow body is connected to the sucking front and comprises an open sucking chamber which is communicated with the respective open sucking chambers of the hinged side bodies. Each side body comprises a hinge with respect to the central body and is elastically loaded for staying aligned with it, therefore the sucking front shows a straight central portion, crosswise the forward direction of the passes, and side portions which may rotate and be folded when finding an hindrance in their forward travel. However, none of the three former heads shows a sucking front capable to be folded forming a point which can reach, for example, corners of the surface to be treated flanked by walls.

[0010] DE-A-4413071, in one of its embodiments, discloses a vacuum cleaner head comprising two arms hinged to each other with respect to an axis substantially perpendicular to the surface to be treated. Both arms include respective open sucking chambers and are elastically loaded so that they tend to keep aligned to each other for forming a straight sucking front crosswise the direction of the passes, although the said arms can be folded in both senses by the effect of any hindrance present in their path. The connection of both open chambers with the negative pressure source is carried out through hoses which join in a collector from which de-

parts a single duct towards the said source. Thus, the hinging area between the arms has no open sucking chamber and the sucking front has an important interruption at its central part. Although the arms can be folded forming a point to reach narrow corners, the vertex of the sucking front is not capable to suck such corner dirt.

[0011] According to the state of the art, a purpose of this invention is to provide a head for a dust vacuum cleaner having a variable geometry sucking front which can adopt a range of shapes comprised from a straight front, crosswise the head central body and relatively wide, adapted for treating large and clear surfaces and a point-shaped front, forming an angle slightly smaller than a straight angle, adapted for reaching angles and corners and capable of sucking the dirt from the said corners.

#### Short explanation of the invention

[0012] Above purpose is achieved, according to this invention, providing a head for a dust vacuum cleaner of the kind comprising open chamber sucking means connected to a negative pressure source through at least a suitable duct, the said open chamber means being partly closed when applying the head on the surface to be treated delimiting at least a sucking front. The essential characteristic consists in that the said sucking front, which is at least one, comprises three portions formed by as many portions of open chamber integrated in respective structural elements hinged to each other with respect to a common axis, the pneumatic communication between the three open chambers being carried out through the hinging area so that the said sucking front is continuous and can adopt a variable geometry from a crosswise straight front to a front folded in a point with capacity for sucking as well at the sides as on the vertex.

[0013] This is essentially achieved integrating the side parts of the open chamber in hollow bodies mechanically and movingly connected with a central hollow body which incorporates the central open chamber, which remains communicated with the side parts of the open chamber in a range of relative positions wished. The central part of open chamber is connected to the said negative pressure source through related hollow body and a suitable duct coupled by means of a swivel joint.

[0014] According to a preferred embodiment of the invention, the two side structural elements are symmetrically arranged at both sides of the central hollow body and the said mechanical connection of the said side structural elements with the said central structural element is carried out by means of an hinging with respect to a common axis which with the head in working position is substantially normal to the said surface to be treated. The hinging area comprises an opening communicated with the central hollow body, as well the said

mutual communication of the parts of the open chamber as the communication of these later with the negative pressure source through the said hinging are maintained.

[0015] Thus, the said range of positions relative to the parts of open chamber is obtained by rotating the side structural elements with respect to the central structural element about the said common axis, between a first position in which the said parts of open chamber are substantially aligned, delimiting a straight sucking front and a second position in which the side parts of the open chamber are forming between them an angle slightly smaller than a straight angle, with the central part of the open chamber located at the vertex, delimiting a point-shaped sucking front, adapted for reaching angles and/or corners and carrying out the sucking of their vertex. It must be pointed out that the sucking front is continuous regardless the shape it adopts between the said first and second positions.

[0016] The head so arranged is provided in addition with elastic means such as one or more springs respectively connected between the side structural elements and the central structural element which tend to maintain the set in the said first position defining a straight sucking front. For avoiding a non wished folding of the said straight front, specially when there is very rough surfaces and/or when the sucking strength is very strong, means for locking the side structural elements rotation have been provided with respect to the central structural element maintaining the set in a fixed position, preferably in the said first position. The said locking means are automatically and independently released when any of the side structural elements collides with an hindrance. This is due to elastically loaded levers which frontally protrude along the whole of each side structural element and which are associated to triggers hooked in respective pawls which are released by moving the said levers allowing the rotation of the side hollow bodies. However, the locking means could also be hand released or locked through an external drive.

[0017] According to a preferred embodiment, the central hollow body incorporates an additional sucking mouth at its rear lower part, the said additional sucking mouth including an obturator linked to foot-levers accessible from outside which allow to open or close it optionally depending on the kind of surface to be treated.

#### short description of the drawings

[0018] These and other characteristics will be best apparent from following detailed description of a preferred example of embodiment of the invention with reference to the drawings attached, in which:

Fig. 1A is an elevation lower view of the head for dust vacuum cleaner of this invention, with the side structural elements arranged according to a first position in which the means of open chamber are

aligned, delimiting a straight sucking front, cross-wise the central structural element, adapted for treating a relatively large and clear surface;

Fig. 1B is an elevation lower view of the head for dust vacuum cleaner of Fig. 1A, with the side structural elements folded according to a second position in which the open chamber means delimit a point-shaped sucking front adapted for reaching angles and corners.

Fig. 2A and 2B are enlarged detailed views showing the hinging area of Fig. 1A and 1B, respectively.

Fig. 3 is an elevation top view of the head of the invention with the side bodies shown in dotted lines in the said first position and solid lines in the second position;

Fig. 4 is an enlarged part view, in cross section taken along line IV-IV of Fig. 1A;

Fig. 5 is an elevation top view of the head of the invention, to which a top housing has been withdrawn for showing how elastic means work which tend to keep the set in the first position shown in Fig. 1A;

Fig. 6 is an enlarged lower elevation part view of the head with the side bodies at the first position from which some parts have been withdrawn to show the mounting and operation of locking means for fastening the set in the said first position; and

Fig. 7 is an exploded view in perspective of a hinging swivel joint of a connection sleeve for a duct of fluid connected of the negative pressure source.

#### Detailed description of the preferred examples of embodiment

**[0019]** Referring now first to Fig. 1A and 1B, the head for the dust vacuum cleaner of this invention is, in general, of the kind comprising open sucking chamber means connected to a negative pressure source (not shown) through at least a suitable duct, such as a stiff pipe 23 (partly shown in Fig. 3) which is generally extended into a hose. The open chamber means are partly closed when applying the head on the surface to be treated, delimiting at least a sucking front, as conventionally found in the art of the sector.

**[0020]** The essential characteristic of the head according to this invention lays in the fact that the said open chamber means comprise side parts 10a, 10b of the open chamber integrated in side structural elements 12a, 12b and a central part 10c of the central open chamber integrated in a central structural element 12c. The said structural elements 12a, 12b 12c are hollow bodies, preferably of plastic material and obtained by injection moulding, and they are mechanically and movably connected to each other by means of a hinge 13 which allows a rotation about a common axis. The said hinge pin 13 is, when the head is in working position, is substantially perpendicular to the surface to be treated, so that side hollow bodies 12a, 12b rotate with respect

to central hollow body 12c on a plane substantially parallel to the said surface.

**[0021]** The hinging area 13 includes an opening 14 which communicates central part 10c of the open chamber with the said negative pressure source through central hollow body 12c and the said pipe 23. Side parts 10a, 10b of the open chamber communicate with central part 10c of the open chamber and therefore with opening 14, in a range of relative positions comprised between a first position (Fig. 1A) and in which the said parts 10a, 10b, 10c of the open chamber are substantially aligned delimiting a straight sucking front and a second position (Fig. 1B) in which side parts 10a, 10b of the open chamber are forming between them an angle slightly smaller than a straight angle, with central part 10c of the open chamber substantially on the vertex, delimiting a point-shaped angular sucking front, adapted for sucking angles and /or corners as it is expressly shown in Fig. 2.

**[0022]** Below, with reference to Fig. 2A and 2B a special configuration of hinge 13 is disclosed which allows this continuous communication of side parts 10a, 10b of the open chamber with central open chamber 10c. Opening 14 occupies the central area of hinge 13, and around the said opening 14 a cylindric wall 17 is arranged coaxial to the common axis of hinge 13. The said cylindric wall 17 is integral with central hollow body 12c and has interruptions, openings or undercuttings 18 through which the said communication of side parts 10a, 10b of the open chamber is carried out with central part 10c of the open chamber. As it can be seen in Fig. 2A and 2B, this arrangement allows the flow between parts 10a, 10b and 10c of the open chamber in the whole of the range of relative positions wished, while the portions of cylindric wall 17 substantially close the flow in other directions. At the vertex area, there exists a channel-shaped undercutting 19 which allows direct sucking from the said vertex towards opening 14. Cylindric wall 17 can additionally include other interruptions, openings or undercuttings allowing a flow therethrough between opening 14 and the area of the said vertex of the sucking front, at least when hollow bodies 12a, 12b, 12c are in the said second position or close to it. In an alternative example of embodiment not shown, each hollow body could have a related cylindric wall coaxially arranged around the opening 14 and provided with suitable interruptions. The relative rotation of the said coaxial cylindric walls would place the interruptions in communication to each other depending on the angular position so that at every moment the side parts of the open chamber would be communicated with the central part of the open chamber while the flow in other directions would be prevented. However, the example of embodiment illustrated in the figures has the advantage to provide a single cylindric wall 17 incorporated to the periphery of a circular part 37 provided with a flat annular portion 38, and a recess on part of the bottom and side of which is located opening 14. Circular part 37 is screwed by it cen-

tral part to central hollow body 12c when side hollow bodies 12a and 12b are mounted so that it keeps the parts in position and collaborates in guiding the rotation thereof at same time that the said annular flat portion 38 covers the interfaces between the said parts avoiding the air flow and that dust penetrated within them.

[0023] Now, back to Fig. 1A and 1B, each of the said side parts 10a, 10b of the open chamber, corresponding to each of the said side structural elements 12a, 12b is formed by a longitudinal slot 16 which has a first end 16a communicating, in any of the said relative positions wished, through the said hinge 13, the said opening 14 being on the central part of the open chamber 10c connected to the negative pressure source through the central structural element 12c. Optionally, the said longitudinal slot 16 of each of the said side structural elements 12a, 12b has a second end 16b which ends at a side end distal from hinge 13, of related side structural element 12a, 12b. The said first ends 16a of slots 16 have their bottoms level with flat portion 38 of the said circular part 37, which facilitates the smooth communication between side parts 10a, 10b of the open chamber with central open chamber 10c.

[0024] In a convenient way, and as conventional in the art of the sector, slots 16 width and deepness decrease when farther away they are from hinge 13 and they are flanked by the side opposite to the sucking front, by a protruding lip length 15 (see also Fig. 4), of flexible and elastic material, such as rubber, which prevents the flow towards parts 10a, 10b, 10c of the open chamber from the said side opposite to the sucking front. Optionally, central side 10c of the open chamber can also be partly flanked by the said lip. Also, by the part corresponding to the sucking front, means can be arranged, eventually elastic means, such as a group of bristles for partly restraining the incoming airflow. In the example illustrated in Fig. 1A and 1B in addition there exists a plurality of small channel-shaped undercuttings 19a distributed between slots 16 and the front part of hollow bodies 12a, 12b in order to provide a given sucking capacity through that front area.

[0025] As illustrated in Fig. 3, it must be pointed out that although the sucking front is kept constant in any of possible positions, width A1 of the sucking front of the head located at the said first position is substantially bigger (about 20% bigger) than width A2 of the sucking front of the head located in the said second position. This allows to optimize to the maximum the negative pressure source machine power without it is required to change the head, because, with the head at first position, shown in Fig. 1A, less consecutive parallel passes will be required for covering a same relatively large and clear surface than in the case that the head had a permanent configuration as that of Fig. 1B, and on the other hand, with the head at the second position, shown in Fig. 1B, there is an easy access to angles and/or corners, such as for example the angles formed by two walls in a corner of a room or corners concealed under pieces

of furniture, the access to which would be prevented for the head which would have a permanent configuration such as that of Fig. 1A.

[0026] As, usually, most of the time the head is used will be in the treatment of relatively large and clear surfaces, the head comprises elastic means which tends to keep the set in the said first position, and means for locking the rotation of side hollow bodies 12a, 12b with respect to the central hollow body 12c, to keep the set fixed in the said first position. These locking means are releasable by moving levers 9 located slightly protruding along the front parts of side hollow bodies 12a, 12b

[0027] Fig. 5 shows this arrangement of elastic means which comprise a bending coil spring 11 having its coils arranged coaxially to hinge pin 13 and branches respectively connected to anchoring points 34 located on side structural elements 12a, 12b. In a similar way, two helical draw-springs (not shown) could be used, each arranged between central hollow body 12c and a related side hollow body 12a, 12b.

[0028] The said levers 9, as shown in Fig. 4 and 6, are arranged lengthwise the front part of side hollow bodies 12a, 12b, partly concealed within a slot provided between two parts or shells 35, 36 forming the said hollow bodies. Each lever 9 (Fig. 6) is fastened to its related hollow body by means of a screw or pin 31 which in turn constitutes a pivotal point with respect to which lever 9 can rotate against the elastic strength of a spring 44. Each lever 9 includes, at an end close to the central area, a trigger 26 which can hook a related pawl 27 of central hollow body 12c. Thus, when lever 9 is moved, for example by contact with an hindrance, it releases trigger 26 of pawl 27 allowing then the rotation of related side hollow body 12a or 12b to the second position. A reinforcing wall 55 of the upper shell 35 serves as a support for the said spring 44 and as internal fastening for the elastic flexible lip 15 (Fig. 4), which is passed through a slot of the lower shell 36.

[0029] Thanks to it, side structural elements 12a, 12b can be independently folded to the second position under the influence of an external strength. For example, when a relatively large and clear surface is being treated, such as the central area of a room, the head is kept at first position, while, when it is pressed against a corner, levers 9 move by the effect of the contact with the walls and release the locking means so that the head adopts by itself required folded position, newly recovering the first position when it is withdrawn from the corner by the effect of spring 11 elastic strength. In a similar way, it can happen that the path of a single side structural element is interfered, for example by the foot of a piece of furniture, in which case, only that side structural element will be temporarily folded towards its second position to recover thereafter its first position. When the surface to be treated is very rough, for example a carpet or moquette and if the machine power is great, the locking means will prevent the trend of the head to fold towards its second position, fighting the strength of the

spring 11, in the head forwards motions. Instead of levers 9, a mechanical locking device (not shown) could be incorporated which can be hand activated or de-activated at will through a button or a slide accessible from outside.

[0030] Referring now to Fig. 4 jointly with the rest of the figures, structural elements 12a, 12b, 12c comprise respective lower surfaces, mutually coplanar, in which related longitudinal slots 16 and opening 14 are open, and there is provided, protruding from the said lower surfaces, wheels 20, 20a which keep the said lower surfaces mutually coplanar substantially parallel to the said surface to be treated and at a predetermined height of this latter, so that the head is easily movable on the surface to be treated when it is applied when working on it. In the example of embodiment illustrated, central hollow body 12c has mounted on its rear part a pair of large and separate wheels 20 which provide stability to the set while each of the side hollow bodies 12a, 12b have a small barrel-shaped wheel mounted 20a.

[0031] It is obvious that the said wheels 20, 20a can be replaced by other members contacting the surface to be treated, such as self-orientable wheels, skids, or sliding hemispherical stops provided that they perform same function. Optionally, the head of the invention comprises means (not shown) for regulating the distance of the protruding portion of the said wheels 20, 20a or other contacting members from the said lower surfaces, regulating with it the said predetermined height at least between two different levels, adapted for surfaces to be treated having different characteristics. In general, a hard and smooth floor requires less height of the open chamber means than a fluffy surface such as a carpet or a moquette.

[0032] As it can be seen in Fig. 1A and 1B, the said central hollow body 12c comprises at its rear lower part, an additional sucking mouth 28 communicated with the central part 10c of the open chamber through an opening provided with an obturator 29 which can be optionally opened or closed by the user depending on the surface to be treated. For this, the said obturator 29 is associated to a mechanism 43 having levers and cams connected to two foot-levers 30a, 30b accessible from outside, by alternate drive of which the said obturator can be placed respectively in open and closed positions. The said additional sucking mouth 28 is flanked by slightly protruding and rotating longitudinal bars 39 which serve to restrain the sucking flow to the area located immediately under mouth 28.

[0033] Hollow bodies 12a, 12b, 12c, according to a preferred example of embodiment are formed each by a pair of parts such as shells 35, 36 of the side hollow bodies shown in Fig. 4, which are obtained by injection moulding a plastic material and they are embedded and fastened to each other by means of screws. Associated to central structural element 12c, a top shell 21 is provided for covering at least hinge 13, the said elastic means, such as spring 11, most of side structural ele-

ments 12a, 12b when they are at the said second position and most of large rear wheels 20. In the example illustrated, central structural element 12c, in addition to the said hollow portion constituting the central part 10c of the open chamber has side extensions 40 designed to completely close upper shell 21 by its lower part. Thus, in the said central structural element 12c, under the said extensions 40, there are formed side recesses designed to partly receive side structural elements 12a, 12b when they adopt the said folded second position.

[0034] Through openings of upper shell 21, emerge, at its rear part, the said foot-levers 30a and 30b. From an opening located between the said foot-levers also emerges a hinged coupling 22 for connecting central part 10c of the open chamber with the said duct 23 for connecting to the negative pressure source. The said hinged coupling 22, the configuration of which is shown in details in Fig. 7 comprises a cylinder or drum-shaped hollow body mounted so that it can rotate a given angle about the axis of the said cylinder or drum in a suitable housing of central hollow body 12c. This hollow body comprises a side opening 24 communicating, whichever its angular position be with open chamber 10c and a cross coupling sleeve 25 protruding from a side area of the cylinder or drum opposite to the said opening 24.

[0035] As shown in Fig. 7, hollow body 22 is formed by two identical halves 22a, 22b, coupled by grooving and tonguing of tongues 41 and grooves 42 formed on their edges. Each half-part 22a, 22b comprises an half of the cylinder or drum, an half of the opening 24 and an half of the sleeve 25. The fact that the two halves 22a, 22b are identical allows that they can be obtained from a plastic material by injection moulding, with a single set of moulds relatively simple despite the complexity of complete hollow body 22.

[0036] Above disclosed example of embodiment has a merely illustrative nature therefore in no case it has to be considered as limiting the object of this invention, the scope of which is defined in claims appended.

## Claims

1. Head for dust vacuum cleaner of the kind comprising open chamber sucking means connected to a negative pressure source through at least a suitable duct, the said open chamber means are partly closed when the head is applied on the surface to be treated, delimiting at least a sucking front the head comprising at least two side hollow bodies (12a, 12b) arranged on both sides of a hinge (13) allowing rotations with respect to a common angle which, with the head in working position is substantially normal to the said surface to be treated, the side hollow bodies (12a, 12b) incorporating respective side parts (10a, 10b) of the open chamber pneumatically with communicated the said negative pressure source so that the said sucking front has

a variable geometry characterized in that the said hinge (13) is integrated in a central hollow body (12c) including a central part of open chamber (10c) connected to the said negative pressure source through an opening (14) located in the hinging area (13) a pneumatic communication of the side parts (10a, 10b) of the open chamber being carried out with the said central part (10c) of the open chamber and opening (14) through the said hinge (13) in a range of relative positions wished and in that the said sucking front having a variable geometry is continuous in any of the said positions and comprises by means of the said three side and central parts (10a, 10b, 10c) of the open chamber the two side and central hinging areas (13) of the head.

2. Head according to claim 1, characterized in that the said range of relative positions wished between the side and central parts (10a, 10b, 10c) of the open chamber is obtained by independent rotation of side hollow bodies (12a, 12b) with respect to the central hollow body (12c) between a first position in which the said parts (10a, 10b, 10c) of the open chamber are substantially aligned, delimiting a straight crosswise sucking front and a second position in which the side parts (10a, 10b) of the open chamber are forming between them an angle slightly smaller than a straight angle, with the said opening (14) substantially on the vertex, delimiting a point-shaped angular sucking front, adapted for angles and/or corners.
3. Head according to claim 2, characterized in that it comprises elastic means, such as one or more springs (11) connected between side hollow bodies (12a, 12b) and central hollow body (12c) which tend to keep the set in the said first position.
4. Head according to claim 3, characterized in that it comprises means for locking the rotation of side hollow bodies (12a, 12b) with respect to central hollow body (12c), the said locking means are releasable and in active situation they keep the set fixed in the said first position.
5. Head according to claim 4, characterized in that the said locking means are released by moving levers (9) which slightly protrude along the front parts of side hollow bodies (12a, 12b) the said run of at least one of the said levers (9) can be caused by any hindrance which frontally contacts related side hollow body (12a, 12b) in its forwards motion.
6. Head according to claim 5, characterized in that each of the said levers (9) is hinged by a swivel point and elastically loaded, including at a moving end a trigger (26) which hooks by the effect of the said elastic load a pawl (27) of central hollow body (12c),

the said lever (9) when it is moved against the said elastic load, releases trigger (26) of pawl (27) allowing then the rotation of related side hollow body (12a, 12b) to the second position.

7. Head according to claim 2, characterized in that each of the said side parts (10a, 10b) of the open chamber, corresponding to each of the said side hollow bodies (12a, 12b), comprises at least a longitudinal slot (16) which has a first end (16a) which communicates, at least at the said relative positions wished, through the said hinge (13) with the said opening (14) of the central part (10c) of the open chamber connected to the negative pressure source through central hollow body (12c) the bottoms of the said first ends (16a) of slots (16) remaining level with the bottom of the central part of open chamber (10c).
8. Head according to claim 7, characterized in that the said hinge (13) comprises a cylindric wall (17) arranged around opening (14) coaxial to hinge pin (13) the said cylindric wall (17) has interruptions, openings or undercuttings (18) through which the said communication of side parts (10a, 10b) of the open chamber is carried out with the central part (10c) of the open chamber allowing the flow between them in the range of relative positions wished while the portions of cylindric wall (17) substantially close the flow in other directions.
9. Head according to claim 8, characterized in that the said cylindric wall additionally includes at least another interruption, opening or undercutting (19) allowing the flow therethrough between opening (14) and the area of the said vertex of the sucking front, at least when hollow bodies (12a, 12b, 12c) are in the said second position or close to it.
10. Head according to claim 9, characterized in that the said cylindric wall (17) is incorporated protruding from the periphery of a circular part (37) provided with a flat annular portion (38), and a recess on part of the bottom and side of which there is opening (14), circular part (37) is screwed to central hollow body (12c) keeping side hollow bodies (12a and 12b) in position and it collaborates in guiding the rotation thereof at same time that the said annular flat portion (38) covers the interfaces between the said parts avoiding the airflow and that dust penetrated within them.
11. Head according to claim 1, characterized in that central hollow body (12c) comprises, at its rear lower part, an additional sucking mouth (28) communicated with the central part (10c) of the open chamber through an opening provided with an obturator (29) which can optionally be opened or closed by

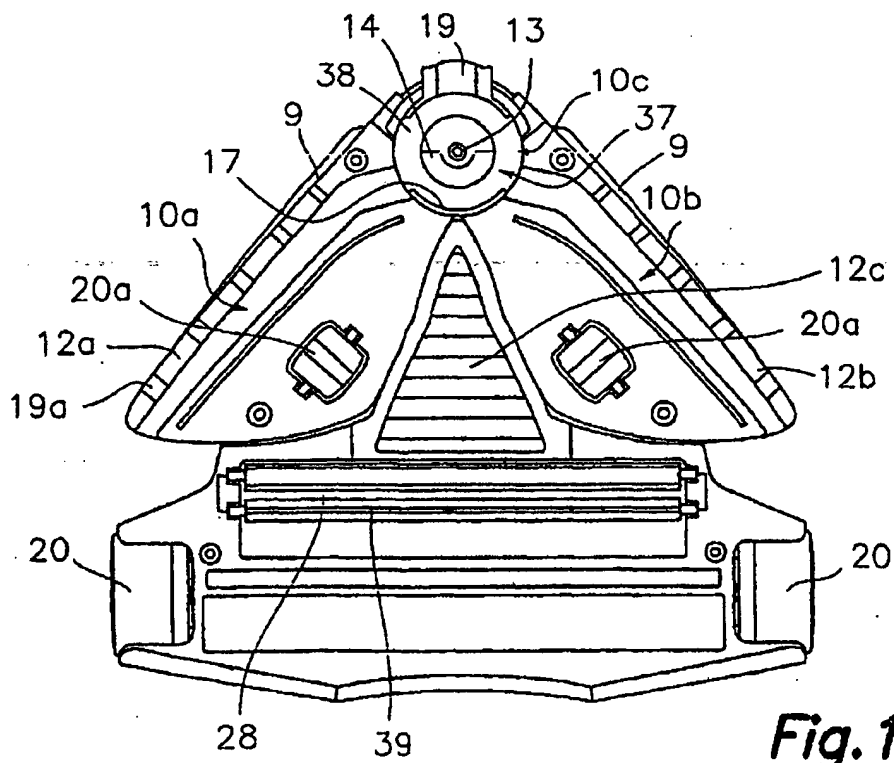
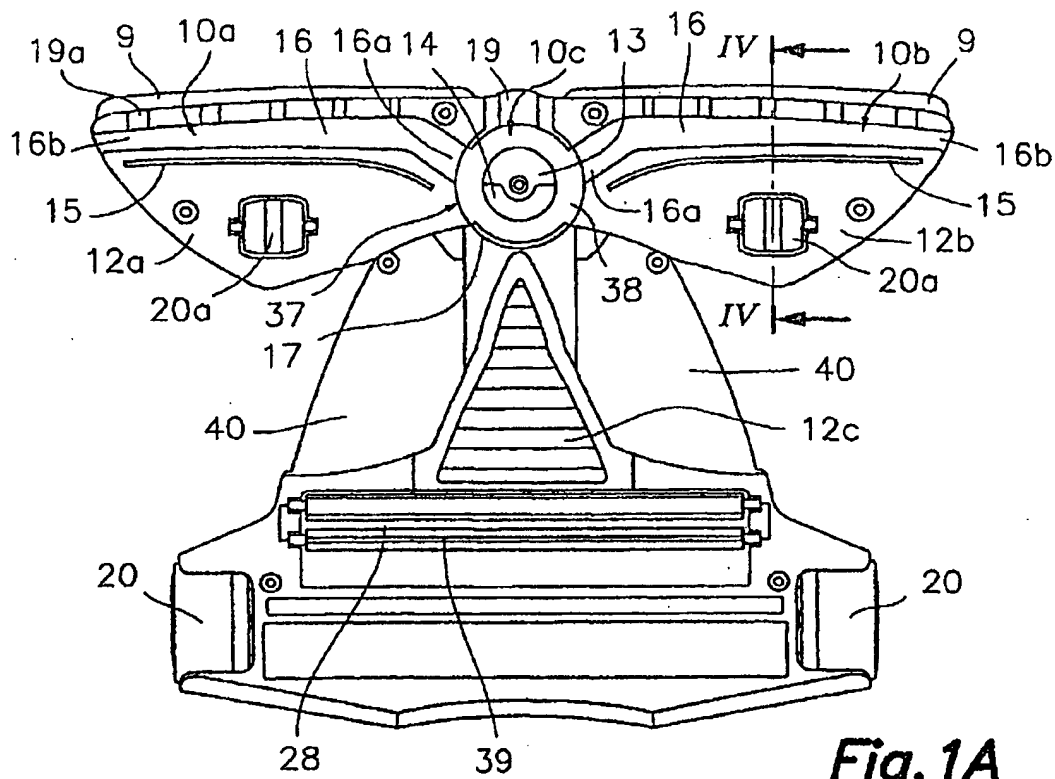


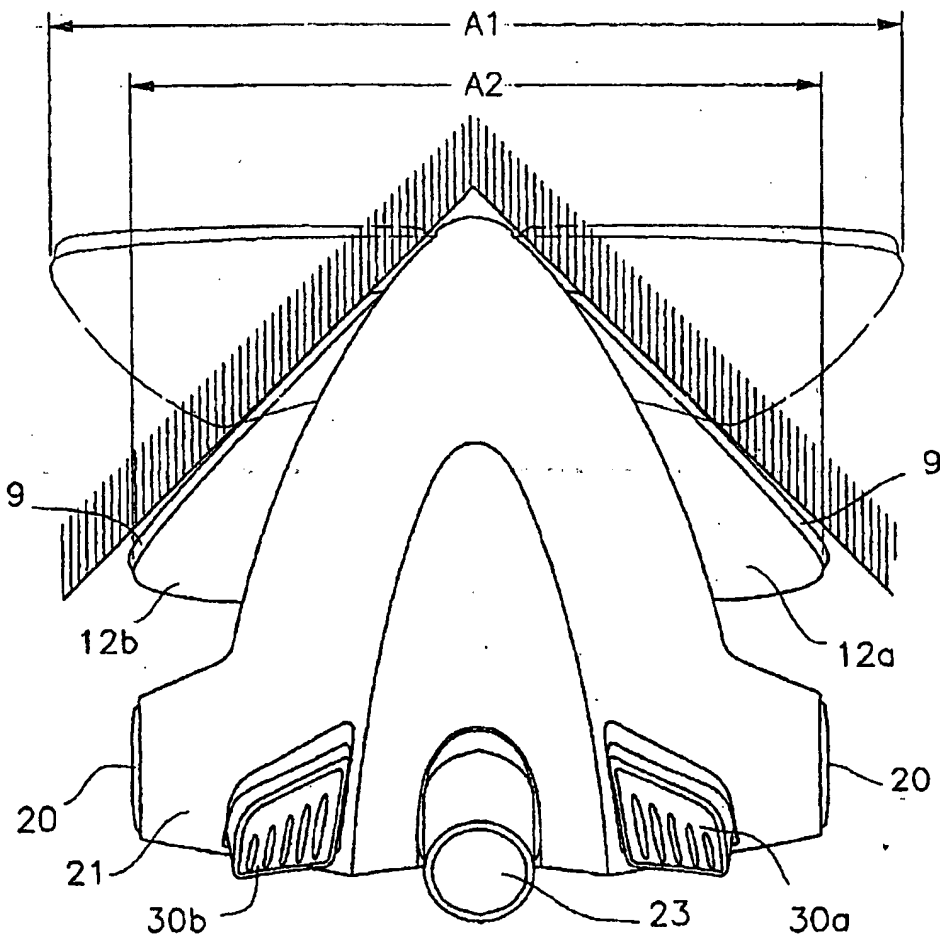
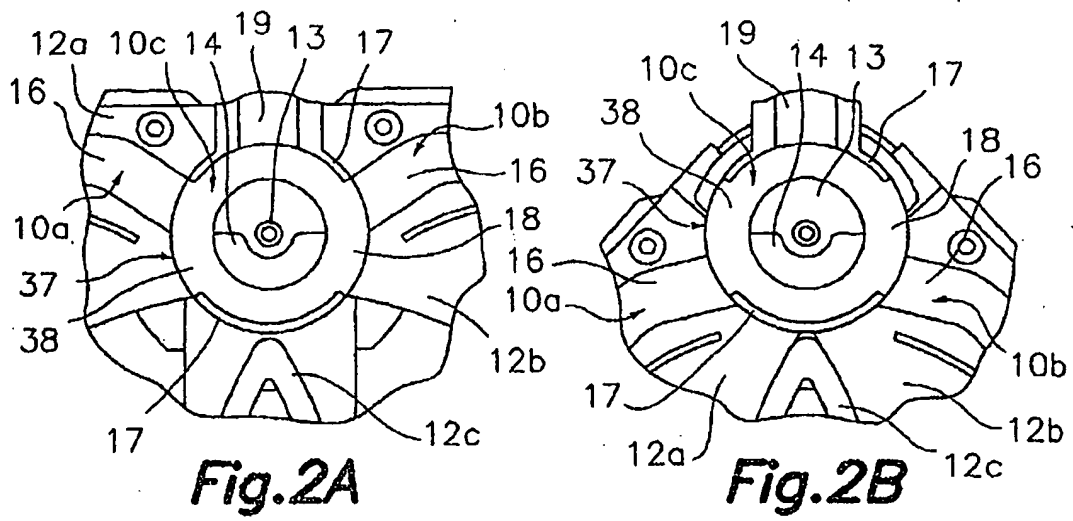
the user depending on the kind of surface to be treated.

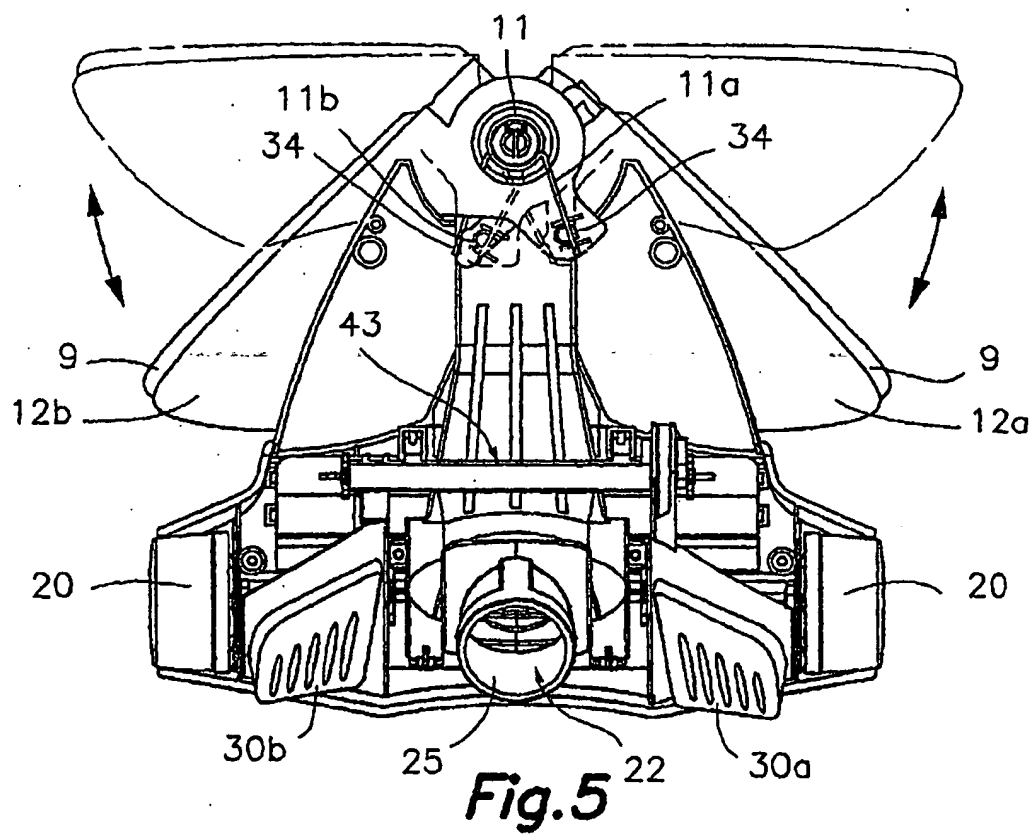
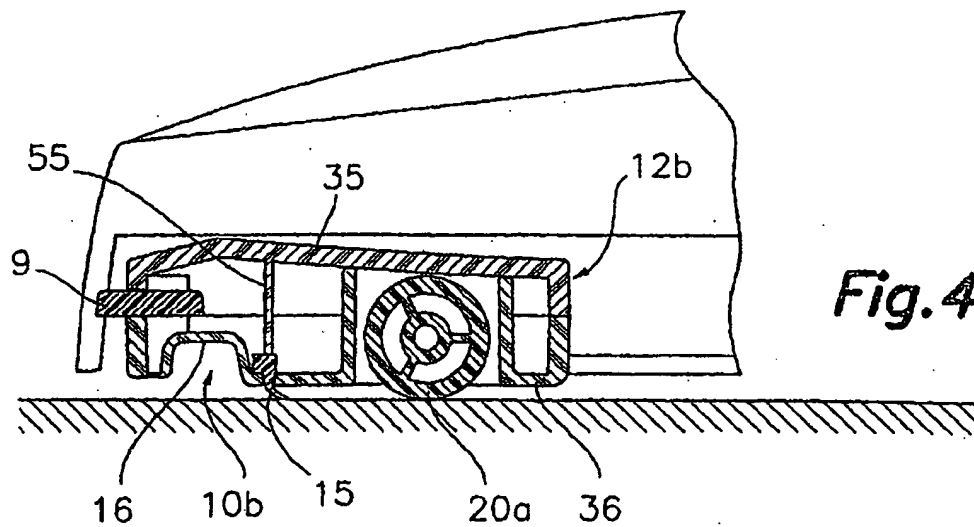
12. Head according to claim 11, **characterized in that** the said obturator (29) is associated to a mechanism of levers and cams connected to two foot-levers (30a, 30b) accessible from outside for placing the said obturator at respectively open and closed positions. 5
13. Head according to claim 7, **characterized in that** the said longitudinal slot (16), which is at least one, of each of the said side hollow bodies (12a, 12b) has a second end (16b) which ends at a side end distal of hinge (13) of related side hollow body (12a, 12b). 10 15
14. Head according to claim 7, **characterized in that** hollow bodies (12a, 12b, 12c) comprise respective lower surfaces, mutually coplanar, in which related longitudinal slots (16) and opening (14) are provided, members protruding from the said lower surfaces for contacting the surface to be treated such as wheels (20, 20a), skids or sliding hemispherical stops which keep the said lower surfaces mutually coplanar substantially parallel to the said surface to be treated and at a predetermined height of this latter, so that the head is easily movable on the surface to be treated when it is applied when working on it. 20 25 30
15. Head, according to claim 14, **characterized in that** it comprises means for regulating the distance of protrusion of the said contacting members from the said lower surfaces, regulating with it the said predetermined height at least between two different levels, adapted for surfaces to be treated having different characteristics. 35
16. Head according to claim 7, **characterized in that** the said slots (16) width and deepness decrease when farther away they are from hinge (13). 40
17. Head according to claim 7, **characterized in that** the said slots (16) and/or opening (14) are flanked by the side opposite to the sucking front, by a protruding lip (15), of flexible and elastic material, such as rubber, which prevents a flow towards respective parts (10a, 10b, 10c) of the open chamber from the said side opposite to the sucking front. 45 50
18. Head according to claim 1, **characterized in that** hollow bodies (12a, 12b, 12c) are formed each by at least two parts which can be socketed and fastened to each other, obtained by plastic material injection moulding, a top shell (21) being provided associated to central hollow body (12c) for covering at least hinge (13), the said elastic means (11) and part of side hollow bodies (12a, 12b) when they are 55

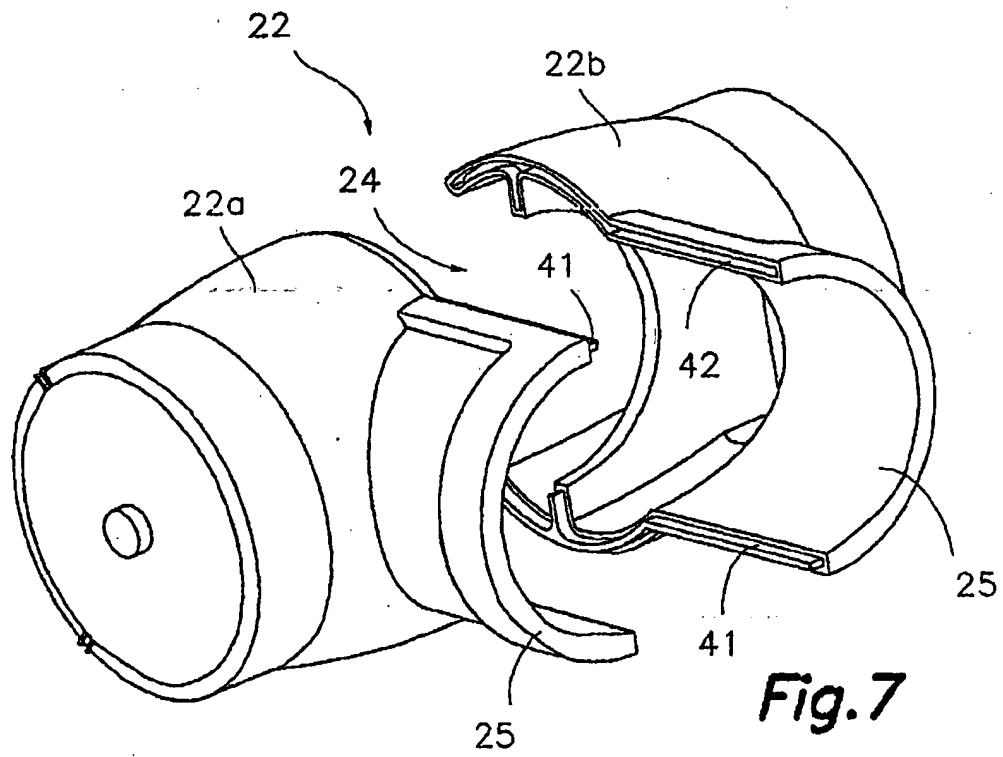
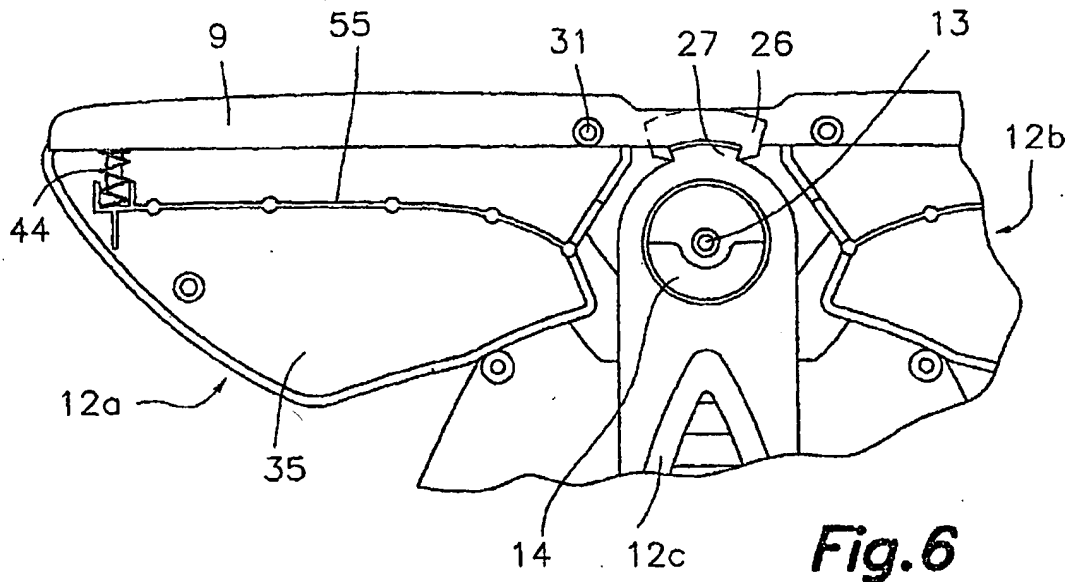
at the said second position, through which shell (21) emerges a hinged coupling (22) of the central part (10c) of the open chamber with the said duct for connecting to the said negative pressure source, and protruding in addition through the said upper shell (21) there is foot-levers (30a, 30b) connected through a lever and cam mechanism to an obturator (29) for opening and closing an additional sucking mouth (28) located at the rear lower part of central hollow body (12c) and communicated with the central part (10c) of the open chamber.

19. Head according to claim 18, **characterized in that** the said hinging coupling (22) comprises a cylinder or drum-shaped hollow body mounted so that it can rotate a given angle about the axis of the said cylinder or drum in a suitable housing of central hollow body (12c) this hollow body comprising a side opening (24) communicating, at any of its position with open chamber (10c) and a crosswise coupling sleeve (25) which protrudes from an opposite side area, the said hollow body (22) being formed by two identical halves (22a, 22b) coupled, each of them comprising one half of the cylinder or drum, one half of the opening (24) and one half of the sleeve (25).









# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/ ES 01/ 00311

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A47L9/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47L9/02, A47L9/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, PAJ, CIBEPAT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 894 468 A (D'ALESSANDRO) 03 February 1999 (03.02.99) The whole document	1 - 7, 11, 13, 14, 17
A	US 3.739.421 A (FUKUBA) 19 June 1973 (19.06.73) The whole document	1 - 4, 7, 13, 14
A	US 5.502.870 A (RAGNER et al.) 02 April 1996 (02.04.96) The whole document	1 - 3, 7, 13, 16, 17
A	DE 4.413.071 A (ZACHHUBER) 19 October 1995 (19.10.95) The whole document	1 - 4, 7, 14, 17
A	DE 1.803.133 A (JORDAN) 19 June 1969 (19.06.69) The whole document	1, 2

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

\* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principles or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

16 November 2001 (16.11.01)

Date of mailing of the international search report

22 November 2001 (22.11.01)

Name and mailing address of the ISA/

S.P.T.O.

Authorized officer

Facsimile No.

Telephone No.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International Application No  
PCT/ES 01/00311

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0 894 468 A	03.02.1999	IT1295116B	30.04.1999
US 3.739.421 A	19.06.1973	CA933710A DE2101659A FR2076110A GB1309062A JP49031227B	18.09.1973 22.07.1971 15.10.1971 07.03.1973 20.08.1974
US 5.502.870 A	02.04.1996	NONE	
DE 4.413.071 A	19.10.1995	NONE	
DE 1.803.133 A	19.06.1969	NONE	

# INFORME DE BÚSQUEDA INTERNACIONAL

Solicitud internacional n°  
PCT/ ES 01/ 00311

## A. CLASIFICACIÓN DEL OBJETO DE LA SOLICITUD

CIP<sup>7</sup> A47L9/02

De acuerdo con la Clasificación Internacional de Patentes (CIP) o según la clasificación nacional y la CIP.

## B. SECTORES COMPRENDIDOS POR LA BÚSQUEDA

Documentación mínima consultada (sistema de clasificación, seguido de los símbolos de clasificación)

CIP<sup>7</sup> A47L9/02, A47L9/06

Otra documentación consultada, además de la documentación mínima, en la medida en que tales documentos formen parte de los sectores comprendidos por la búsqueda

Bases de datos electrónicas consultadas durante la búsqueda internacional (nombre de la base de datos y, si es posible, términos de búsqueda utilizados)

EPODOC, WPI, PAJ, CIBEPAT

## C. DOCUMENTOS CONSIDERADOS RELEVANTES

Categoría*	Documentos citados, con indicación, si procede, de las partes relevantes	Relevante para las reivindicaciones n°
A	EP 0 894 468 A (D'ALESSANDRO) 03.02.1999, todo el documento	1 - 7, 11, 13, 14, 17
A	US 3.739.421 A (FUKUBA) 19.06.1973; todo el documento	1 - 4, 7, 13, 14
A	US 5.502.870 A (RAGNER et al.) 02.04.1996; todo el documento.	1 - 3, 7, 13, 16, 17
A	DE 4.413.071 A (ZACHHUBER) 19.10.1995; todo el documento	1 - 4, 7, 14, 17
A	DE 1.803.133 A (JORDAN ) 19.06.1969, todo el documento	1, 2

☐ En la continuación del recuadro C se relacionan otros documentos ☒ Los documentos de familia de patentes se indican en el anexo

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"T" documento ulterior publicado con posterioridad a la fecha de presentación internacional o de prioridad que no pertenece al estado de la técnica pertinente pero que se cita por permitir la comprensión del principio o teoría que constituye la base de la invención.

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"&" documento que forma parte de la misma familia de patentes.

Fecha en que se ha concluido efectivamente la búsqueda internacional. 16.11.2001

Fecha de expedición del informe de búsqueda internacional  
22 NOV 2001 22.11.01

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**INFORME DE BÚSQUEDA INTERNACIONAL**  
Información relativa a miembros de familias de patentes

Solicitud internacional n°

PCT/ ES 01/ 00311

Documento de patente citado en el informe de búsqueda	Fecha de publicación	Miembro(s) de la familia de patentes	Fecha de publicación
EP 0 894 468 A	03.02.1999	IT1295116B	30.04.1999
US 3.739.421 A	19.06.1973	CA933710A DE2101659A FR2076110A GB1309062A JP49031227B	18.09.1973 22.07.1971 15.10.1971 07.03.1973 20.08.1974
US 5.502.870 A	02.04.1996	Ninguno	
DE 4.413.071 A	19.10.1995	Ninguno	
DE 1.803.133 A	19.06.1969	Ninguno	